PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

RUUSKANEN, Juha-Pekka
Page White & Farrer
54 Doughty Street
London WC1N 2LS
ROYAUME-UNI

Date of mailing (day/month/year) 15 January 2002 (15.01.02)	
Applicant's or agent's file reference 102687/JPR	**IMPORTANT NOTIFICATION**
International application No. PCT/EP00/08145	**International filing date** (day/month/year) 17 August 2000 (17.08.00)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address	State of Nationality	State of Residence
NOKIA NETWORKS OY Keilalahdentie 4 FIN-02150 Espoo Finland	FI	FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address	State of Nationality	State of Residence
NOKIA CORPORATION Keilalahdentie 4 FIN-02150 Espoo Finland	FI	FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Beate GIFFO-SCHMITT
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREA

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
102687/JPR		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP 00/ 08145	17/08/2000	18/08/1999
Applicant		
NOKIA NETWORKS OY		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 3

   [ ] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [X] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/08145

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B7/005

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 924 043 A (TAKANO MICHIAKI) 13 July 1999 (1999-07-13) column 18, line 9 -column 19, line 41; figures 10,25-29	1-5, 7-17,19
A	EP 0 709 973 A (NIPPON TELEGRAPH & TELEPHONE) 1 May 1996 (1996-05-01) abstract; figures 10,13 column 3, line 5 - line 32 column 7, line 16 - line 56; figures 5,6 column 8, line 57 -column 9, last line; figures 7,8	1,3-7, 12,15-18
A	EP 0 822 672 A (NIPPON TELEGRAPH & TELEPHONE) 4 February 1998 (1998-02-04) abstract; figures 6,8,10,25,26	1-3,5, 9-13, 15-17,19

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 November 2000	04/12/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Sieben, S

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 26716 A (NOKIA MOBILE PHONES LTD ;NOKIA TELECOMMUNICATIONS OY (FI); SAARIO) 24 July 1997 (1997-07-24) abstract page 4, line 3 - line 27 page 6, line 8 -page 8, line 15 ---	1-3,5-7, 11-13, 15-17,19
A	US 5 835 527 A (LOMP GARY R) 10 November 1998 (1998-11-10) column 21, line 18 - line 64; figures 22,23 ---	1-3,5-7, 12,13, 15-17,19
A	EP 0 682 417 A (NIPPON TELEGRAPH & TELEPHONE) 15 November 1995 (1995-11-15) abstract; figures 2,3; tables 1,2 ---	1-3,5-8, 11-17,19
E	WO 00 52846 A (HAARDT MARTIN ;SCHULZ EGON (DE); SIEMENS AG (DE); DILLINGER MARKUS) 8 September 2000 (2000-09-08) abstract; figure 2 page 4, line 20 - last line claims 1,12,14,15 -----	1,4-6, 11,12, 15,16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 00/08145

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5924043 A	13-07-1999	JP 10126337 A	15-05-1998
EP 0709973 A	01-05-1996	CN 1123976 A,B	05-06-1996
		CN 1264991 A	30-08-2000
		EP 1041732 A	04-10-2000
		EP 1041733 A	04-10-2000
		JP 3014308 B	28-02-2000
		JP 8181653 A	12-07-1996
		US 5873028 A	16-02-1999
EP 0822672 A	04-02-1998	CA 2211925 A	29-01-1998
		CN 1175173 A	04-03-1998
		JP 10112683 A	28-04-1998
		US 5933782 A	03-08-1999
WO 9726716 A	24-07-1997	FI 960276 A	20-07-1997
		AU 716337 B	24-02-2000
		AU 1446197 A	11-08-1997
		EP 0815656 A	07-01-1998
		JP 11506891 T	15-06-1999
		NO 974312 A	18-11-1997
		US 6104918 A	15-08-2000
US 5835527 A	10-11-1998	US 5574747 A	12-11-1996
		US 5920590 A	06-07-1999
		US 5995538 A	30-11-1999
		AU 4529796 A	24-07-1996
		EP 1041727 A	04-10-2000
		EP 1041728 A	04-10-2000
		EP 1043844 A	11-10-2000
		EP 0801856 A	22-10-1997
		FI 972241 A	04-09-1997
		IL 116444 A	17-08-1999
		JP 10512113 T	17-11-1998
		WO 9621295 A	11-07-1996
		US 5673286 A	30-09-1997
		US 5563907 A	08-10-1996
		ZA 9510969 A	08-07-1996
EP 0682417 A	15-11-1995	JP 2980156 B	22-11-1999
		JP 8032513 A	02-02-1996
		CA 2149094 A,C	13-11-1995
		CN 1117225 A,B	21-02-1996
		KR 143836 B	01-08-1998
		US 5604766 A	18-02-1997
WO 0052846 A	08-09-2000	DE 19909299 A	21-09-2000

COPY

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* 102687/JPR

Box No. I TITLE OF INVENTION

CONNECTION CONTROL IN A COMMUNICATION SYSTEM

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

Nokia Networks Oy
Keilalahdentie 4
FIN-02150 ESPOO
Finland

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

SALONAHO, Oscar
Oksasenkatu 4 bA 8
00100 Helsinki
Finland

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Finland

State *(that is, country)* of residence: Finland

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

RUUSKANEN, Juha-Pekka
Page White & Farrer
54 Doughty Street
London WC1N 2LS
United Kingdom

Telephone No. 020 7831-7929

Facsimile No. 020 7831-8040

Teleprinter No. 8955681

☐ **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

☒ **AP** **ARIPO Patent:** **GH** Ghana, **GM** Gambia, **KE** Kenya, **LS** Lesotho, **MW** Malawi, **MZ** Mozambique, **SD** Sudan, **SL** Sierra Leone, **SZ** Swaziland, **TZ** United Republic of Tanzania, **UG** Uganda, **ZW** Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

☒ **EA** **Eurasian Patent:** **AM** Armenia, **AZ** Azerbaijan, **BY** Belarus, **KG** Kyrgyzstan, **KZ** Kazakhstan, **MD** Republic of Moldova, **RU** Russian Federation, **TJ** Tajikistan, **TM** Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

☒ **EP** **European Patent:** **AT** Austria, **BE** Belgium, **CH and LI** Switzerland and Liechtenstein, **CY** Cyprus, **DE** Germany, **DK** Denmark, **ES** Spain, **FI** Finland, **FR** France, **GB** United Kingdom, **GR** Greece, **IE** Ireland, **IT** Italy, **LU** Luxembourg, **MC** Monaco, **NL** Netherlands, **PT** Portugal, **SE** Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

☒ **OA** **OAPI Patent:** **BF** Burkina Faso, **BJ** Benin, **CF** Central African Republic, **CG** Congo, **CI** Côte d'Ivoire, **CM** Cameroon, **GA** Gabon, **GN** Guinea, **GW** Guinea-Bissau, **ML** Mali, **MR** Mauritania, **NE** Niger, **SN** Senegal, **TD** Chad, **TG** Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

☒ **AE** United Arab Emirates
☒ **AG** Antigua and Barbuda
☒ **AL** Albania .....
☒ **AM** Armenia .....
☒ **AT** Austria .....
☒ **AU** Australia .....
☒ **AZ** Azerbaijan
☒ **BA** Bosnia and Herzegovina .....
☒ **BB** Barbados
☒ **BG** Bulgaria .....
☒ **BR** Brazil .....
☒ **BY** Belarus .....
☒ **BZ** Belize
☒ **CA** Canada
☒ **CH and LI** Switzerland and Liechtenstein
☒ **CN** China .....
☒ **CR** Costa Rica .....
☒ **CU** Cuba .....
☒ **CZ** Czech Republic .....
☒ **DE** Germany .....
☒ **DK** Denmark .....
☒ **DM** Dominica
☒ **DZ** Algeria .....
☒ **EE** Estonia .....
☒ **ES** Spain .....
☒ **FI** Finland .....
☒ **GB** United Kingdom
☒ **GD** Grenada
☒ **GE** Georgia .....
☒ **GH** Ghana .....
☒ **GM** Gambia
☒ **HR** Croatia .....
☒ **HU** Hungary .....
☒ **ID** Indonesia
☒ **IL** Israel .....
☒ **IN** India .....
☒ **IS** Iceland
☒ **JP** Japan .....
☒ **KE** Kenya .....
☒ **KG** Kyrgyzstan .....
☒ **KP** Democratic People's Republic of Korea .....
☒ **KR** Republic of Korea .....
☒ **KZ** Kazakhstan .....
☒ **LC** Saint Lucia
☒ **LK** Sri Lanka
☒ **LR** Liberia
☒ **LS** Lesotho .....
☒ **LT** Lithuania
☒ **LU** Luxembourg
☒ **LV** Latvia
☒ **MA** Morocco .....
☒ **MD** Republic of Moldova .....
☒ **MG** Madagascar .....
☒ **MK** The former Yugoslav Republic of Macedonia .....
☒ **MN** Mongolia
☒ **MW** Malawi .....
☒ **MX** Mexico .....
☒ **MZ** Mozambique
☒ **NO** Norway
☒ **NZ** New Zealand .....
☒ **PL** Poland .....
☒ **PT** Portugal .....
☒ **RO** Romania
☒ **RU** Russian Federation .....
☒ **SD** Sudan
☒ **SE** Sweden
☒ **SG** Singapore
☒ **SI** Slovenia .....
☒ **SK** Slovakia .....
☒ **SL** Sierra Leone .....
☒ **TJ** Tajikistan .....
☒ **TM** Turkmenistan .....
☒ **TR** Turkey .....
☒ **TT** Trinidad and Tobago .....
☒ **TZ** United Republic of Tanzania
☒ **UA** Ukraine .....
☒ **UG** Uganda .....
☒ **US** United States of America .....
☒ **UZ** Uzbekistan .....
☒ **VN** Viet Nam .....
☒ **YU** Yugoslavia .....
☒ **ZA** South Africa .....
☒ **ZW** Zimbabwe .....

Check-box reserved for designating States which have become party to the PCT after issuance of this sheet:

☐ .....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)*

Supplemental Box *If the Supplemental Box is not used, this sheet should not be included in the request.*

*1. If, in any of the Boxes, **the space is insufficient** to furnish all the information: in such case, write "Continuation of Box No. ..." [indicate the number of the Box] and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:*

*(i) **if more than two persons are involved as applicants and/or inventors** and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;*

*(ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication **"the States indicated in the Supplemental Box"** is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;*

*(iii) if, in Box No. II or in any of the sub-boxes of Box No. III, **the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America**: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;*

*(iv) if, in addition to the agent(s) indicated in Box No. IV, there are **further agents**: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;*

*(v) if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "**patent of addition.**" or "**certificate of addition.**" or if, in Box No. V, the name of the United States of America is accompanied by an indication "**continuation**" or "**continuation-in-part**": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;*

*(vi) if, in Box No. VI, there are **more than three earlier applications whose priority is claimed**: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;*

*(vii) if, in Box No. VI, **the earlier application is an ARIPO application**: in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed.*

*2. If, with regard to the **precautionary designation statement** contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.*

*3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning **non-prejudicial disclosures or exceptions to lack of novelty**: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.*

Continuation of Box IV

Agents continues

PALMER, ROGER (GB)
RICHARDS, DAVID JOHN (GB)
PENDLEBURY, ANTHONY (GB)
JENKINS, PETER DAVID (GB)
DRIVER, VIRGINIA ROZANNE (GB)
DANIELS, JEFFERY NICHOLAS (GB)
STYLE, KELDA CAMILLA KAREN (GB)
NEOBARD, WILLIAM JOHN (GB)
SHACKLETON, NICOLA (GB)
SLINGSBY, PHILIP ROY (GB)
HILL, CHRISTOPHER MICNAEL (GB)
WILLIAMS, DAVID JOHN (GB)

ALL OF: PAGE WHITE & FARRER
54 Doughty Street
London WC1N 2LS
United Kingdom

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 18 August 1999	9919595.0	GB		
item (2)				
item (3)				

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): _____

** Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)* : ISA / EP

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority):*

Date (day/month/year)	Number	Country (or regional Office)
27 March 2000	RS103900	EP

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets**:

request	:	4
description (excluding sequence listing part)	:	16
claims	:	4
abstract	:	1
drawings	:	4
sequence listing part of description	:	
Total number of sheets	:	29

This international application is **accompanied** by the item(s) marked below:

1. ☐ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other *(specify)*:

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: EN

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

RUUSKANEN, Juha-Pekka.....(Agent)

For receiving Office use only

1. Date of actual receipt of the purported international application:
2. Drawings: ☐ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA /
6. ☐ Transmittal of search copy delayed until search fee is paid.

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
102687/JPR		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP00/08145	17/08/2000	18/08/1999
International Patent Classification (IPC) or national classification and IPC H04B7/005		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
13/03/2001	06.12.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Koch, B Telephone No. +49 89 2399 7303

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/08145

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-16	as originally filed				

Claims, No.:

1-16,17 (part)	as originally filed				
17 (part)	as received on	19/09/2001	with letter of	14/09/2001	

Drawings, sheets:

1/4-4/4	as originally filed				

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-17
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-17
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-17
	No:	Claims	

2. Citations and explanations
   see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. **Field:** The invention relates to a method (claim 1) and systems (claims 12 and 17) for controlling a transmission parameter in a communications system.

2. **Prior art:** US-A-5924043 (D1) is considered as closest prior art to the subject-matter of claim 17 and discloses a receiving station *(cf. "base station" in col. 1, lines 62-63)* for use in a communication system, comprising:
   - means for receiving a signal from a transmitting station *(cf. col. 1, line 65);*
   - a control unit *(cf. col. 2, lines 4-14)* for determining a power up requirement or a power down requirement;
   - means for monitoring *(cf. "power level setter" 183 in fig. 25 and col. 18, lines 10-62)* the distribution of the power up and power down requirements *(cf. "TPC bits in a predetermined pattern" in col. 18, lines 15-16)* over a period;

3. **Problem:** The problem over D1 is how to avoid unnecessary high power consumption of a mobile transmitter after a rapid improvement of the transmission channel.

4. **Solution:** The invention solves this problem by means for generating and transmitting a request for a change in connection quality target to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored power up/down distribution.

D1 does not disclose the changing of a connection quality target. There is no hint in D1 that would lead the skilled person in an obvious way to the claimed invention by modifying or combining the apparatus of D1 with any other prior art available from the search report. Claim 17 is therefore novel and inventive (Articles 33(2) and 33(3) PCT).

Claim 12 defines a controller, and claim 1 defines a method embodying the present invention, both comprising features corresponding to claim 17.

5. **Art. 34(2)(b) PCT:**
Independent claim 17 is based on claims 17 and 18 as originally filed.

Re Item VII
Certain defects in the international application

1. The Independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

Re Item VIII
Certain observations on the international application

1. The present wording (e.g."...for controlling" or "...for monitoring") of **claims 12-17** have been read as "...suitable for controlling/monitoring" etc., according to the Guidelines, C-III, 4.8. Furthermore, the present wording seems, at least in part, to define the operation of the apparatus by a method of using the apparatus rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear from these claims, contrary to the requirements of Article 6 PCT. It seems that this could have been overcome by redrafting these claims using the formulation "...arranged to/for...".

2. It is clear from the description (see e.g. page 7, line 5) that the following feature is essential to the definition of the invention:
(I) The quality target is a connection quality target.
It is not understandable how the problem posed on page 4, lines 26-30 of the description can be solved without changing the quality target of the connection, not merely any arbitrary "quality target" (Article 6 PCT).
Since the independent **claims 1, 12 and 17** do not contain these features they do not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

3. It is unclear (Article 6 PCT) in **claims 12 and 17**, whether the "quality target" and the " quality target of the received transmission" are different from the "quality target for the received signal" as defined in claim 1, or whether merely the wording has been used inconsistently.

4. The vague and imprecise statement in the description on page 16 implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them (see also the PCT Guidelines, III-4.3a).

comprising:

means for receiving a signal from a transmitting station;

a control unit for determining a power up requirement or a power down requirement;

means for monitoring the distribution of the power up and power down requirements over a period; and

means for generating and transmitting a request for a change in quality target to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 February 2001 (22.02.2001)

PCT

(10) International Publication Number
WO 01/13536 A1

(51) International Patent Classification[7]: H04B 7/005

(21) International Application Number: PCT/EP00/08145

(22) International Filing Date: 17 August 2000 (17.08.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9919595.0 18 August 1999 (18.08.1999) GB

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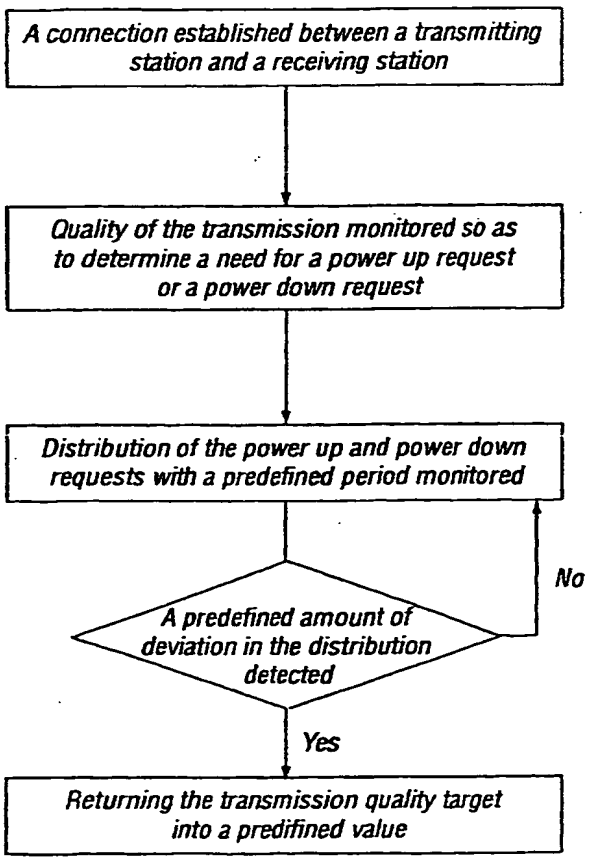
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: CONNECTION CONTROL IN A COMMUNICATION SYSTEM



(57) Abstract: The present invention relates to a method of controlling at least one transmission parameter of a connection between a transmitting station (BS) and receiving station (MS). The method comprises the steps of receiving at the receiving station a transmission signal from the transmitting station, determining from the received transmission signal whether there exists a power up requirement or a power down requirement, and monitoring the distribution of the power up and power down requirements over a period. If a predefined form of the distribution is detected, the quality target of the connection is changed. The present invention relates also to an arrangement and a reeiving station for implementing the method.

WO 01/13536 A1

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CONNECTION CONTROL IN A COMMUNICATION SYSTEM

FIELD OF THE INVENTION

The present invention relates to a method of controlling at least one transmission parameter of a connection between a transmitting station and a receiving station in a communication system. The invention relates further to an arrangement in a communication system and to a receiving station for use in a communication system.

BACKGROUND OF THE INVENTION

In a mobile telecommunication system, such as a CDMA (Code Division Multiple Access) or WCDMA (Wide-band CDMA) or TDMA (Time division Multiple Access) system, transmission power levels between a base station (BS) and a mobile station (MS) associated with said BS can be continuously adjusted during an ongoing connection between the BS and the MS. This is done in order to provide a sufficient quality for the transmission in various conditions. To reduce power consumption and interference it is also preferred to keep the required transmission power levels as low as possible at the same time. By means of this it is possible to avoid "wasting" any network resources and MS battery resources, and to enable as great a number of mobile stations as possible to communicate simultaneously with the same BS having only limited power resources.

One system of power control is based on Power Control (PC) commands transmitted from one station to another to cause the other station to alter its power. The commands can be transmitted e.g. in a WCDMA closed loop. The closed loop power

control mechanism between the BS and MS is used for equalising the power of signals from the MS at the BS input and also for compensating fast power deviations from the nominal level. These closed loop PC (CL PC) commands can be sent both in the uplink (towards the base station) and in the downlink (towards the mobile station), whereafter the BS or the MS will process the received command and reduce/increase its transmission power towards the receiving station (i.e. MS or BS respectively) accordingly.

For example, in the currently proposed WCDMA system it is envisaged that an outer loop PC generated by a radio network controller (RNC) of the WCDMA system will attempt to set the connection quality target (that the closed loop follows) of a physical connection between the BS and MS to be such that the required FER (Frame Error Ratio) target of the connection is met with a minimal connection quality target. The connection quality target can be announced e.g. by means of a so called Eb/No (Signalling Energy/Noise) target or SIR (signal to Interference Ratio) target or a similar parameter indicating some quality measurement for the connection. The relationship is such that the connection quality target (e.g. the SIR target) has to be set such that the FER remains at an appropriate level. The actual connection quality value (e.g. SIR) is then adjusted in accordance with the target value, and should follow any changes in the target value. The idea behind this is that by increasing the connection quality target value the connection quality will increase and the FER will improve.

However, if the FER target cannot be met due to e.g. a limitation in the available transmission power when severe interference or attenuation is predicted, the connection quality target will start increasing even though this rise in

the connection quality target will not help in causing a better connection between the MS and the BS. If the power limitation is caused by a temporary lack of power caused by a condition such as slow fading or a temporarily weak connection (if, for instance, the MS is situated temporarily in a tunnel or cellar), the quality target will be unnecessarily high once this condition has been removed. This will result in an excessively high transmitted power until the quality target has returned to its normal (appropriate) level. At the BS side this unnecessarily used power resource could be used for transmission towards other mobile stations. At the MS side this will lead among other things, to unnecessary high power consumption and to a possible disturbance to other radio and/or electronic devices.

To give a more precise example, if the BS runs out of power (i.e. a power limitation situation occurs), then the mobile station MS will experience a higher FER than the set FER target. This will result (if not limited by some means) in an unlimited rise of the SIR target value. In accordance with one exemplifying possibility the average rate per frame of this rise can be given by the formula

$$rise\_per\_frame=(FER-FER_{th})step\_size$$

where

FER is the actual obtained FER,

FER_{th} is the FER target and

step_size is the step size of the outer loop algorithm

Thus, if the actual FER is 2%, the FER target is 1% and the step size is 0.5dB the SIR target will in ten seconds (1000 frames) be raised by 1%*1000*0.5 dB = 5dB, which can be

considered to be a substantial rise. If the higher FER has been caused by e.g. shadowing and the situation changes suddenly the SIR target will be much too high for a while after this condition ends. In this specific example, the SIR target would decrease gradually back to its appropriate value in approximately 5/0.0005 = 1000 frames = 10 seconds.

Earlier proposals to solve this problem have been based on setting absolute limits on the values of the quality targets. There are, however, some problems associated with this type of solution. Firstly, the set absolute limits have to be relatively loose due to the variations in the required quality target for satisfactory quality of the communication. Secondly, the setting of absolute limits for the MS is problematic due to the fact that the absolute value of the quality value setpoint depends heavily on the used estimation method.

SUMMARY OF THE INVENTION

The embodiments of the present invention aim to at least partially overcome one or several of the disadvantages of the prior art proposals in avoiding an undesired and/or unlimited increase of the connection quality target for a connection between a transmitting and a receiving station in a mobile communication system. A further preferred aim of the embodiments is to provide a solution by means of which it is possible to rapidly lower the transmission power level to an appropriate value after a rapid improvement in the air interface between the transmitting and receiving station.

According to a first aspect, the invention provides a method of controlling at least one transmission parameter of a connection

between a transmitting station and receiving station in a communication system comprising:

receiving at the receiving station a transmission signal from the transmitting station;

determining from the received transmission signal whether there exists a power up requirement or a power down requirement;

monitoring the distribution of the power up and power down requirements over a period; and

in the event that a predefined form of the distribution is detected, changing quality target for the received signal.

According to a second aspect the invention provides an arrangement for controlling at least one transmission parameter of a connection between a transmitting station and a receiving station in a communication system comprising:

a control unit for determining a power up requirement or a power down requirement;

means for monitoring the distribution of the power up and power down requirement over a period; and

means for changing the quality target of the transmission in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

According to a further aspect, the invention provides a receiving station for use in a communication system, comprising:

means for receiving a signal from a transmitting station;

a control unit for determining a power up requirement or a power down requirement;

means from monitoring the distribution of the power up and power down requirements over a period; and

means for generating and transmitting a request for

transmission parameter change to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

In a more specific embodiment a transmission power level parameter is also changed. A still more specific embodiment comprises transmitting power control commands between the transmitting station and the receiving station, said power control commands including either the power up or the power down request in accordance with the determined requirement, wherein the step of monitoring the distribution of the power up and the power down requirements comprises monitoring the requests derived from the power control commands. According to one alternative the form of the distribution of the power up and the power down requirements is defined on basis of variations in the Signal Interference Ratio (SIR) target. The transmitting station can be a base station and the receiving station a mobile station, or then vice versa. Said determining of the power up requirement or power down requirement and said monitoring of the distribution can be accomplished at the receiving station, or then said determining of the power up requirement or power down requirement is accomplished at the receiving station and said monitoring of the distribution is accomplished at the transmitting station. The step of changing the transmission parameter may comprise returning the transmission parameter to a predefined or default value. At least some of parameters controlling the transmission parameter of the connection can be transmitted to the receiving and/or transmitting station using mobile networks apparatus. In addition, it is possible to use at least two different sets of control parameters simultaneously when controlling the connection.

Several advantages are obtainable by means of the embodiments of the present invention, as they provide a new type of solution for controlling the connection between transmitting and receiving stations, and for instance, for controlling the connection quality target and/or power levels used for the transmission. By means of the proposed embodiments it is possible to prevent unnecessary high power levels after a temporality weak connection has returned to its normal quality. It is also possible to prevent unnecessary rise in the power level the receiving station asks from the transmitting station in case where it is not possible for the transmitting station to provide any more power.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention and other objects and advantages thereof will now be explained in an exemplifying manner with reference to the annexed drawings, in which:

Figure 1 shows a part of a mobile communication system;

Figure 2 shows a transmitter-receiver pair;

Figure 3 shows a flow chart in accordance with one embodiment; and

Figures 4 to 6 illustrate results of simulations accomplished for the proposed method.

DETAILED DESCRIPTIONS OF THE DRAWINGS

Figure 1 is a schematic presentation of a part of a mobile communication system, disclosing a base station BS and some mobile stations MS communicating with the BS. The MS could be moveable (e.g. a hand portable mobile phone or a hand portable computer provided with a radio transceiver facility or a communicator) or could be fixed in location (e.g. if the MS is

to serve an office at a fixed side). The skilled person is familiar with the operational principles and the various components of a mobile communication system, such as a CDMA system, WCDMA system, FDMA system or a TDMA system providing mobility for the mobile station users thereof, and thus these will not be described in detail. The other parts of a functioning mobile network apparatus have also been omitted from Figure 1 for the reasons of clarity.

The BS transmits to each of the mobile stations MS with a power level that is adjusted in accordance with, for example, a Power Control (PC) command or similar message received from each of the respective mobile stations MS, that is, the transmission power levels can be different at a given moment between the base station BS and each of the respective mobile stations MS. Correspondingly, each MS transmits towards the BS with a power level adjusted in accordance with particular PC commands transmitted by the BS to that precise MS. For example, in the proposed WCDMA system the PC commands would be transmitted in a WCDMA closed loop. In order to be able to accomplish this functionality, both the BS and the MS are equipped with appropriate control and processing units.

Figure 2 shows in more detail one base station and mobile station pair. The mobile station comprises an antenna 6 via which it is arranged to transmit and receive signalling from the base station. The base station comprises correspondingly an antenna 16 via which it is arranged to transmit and receive signalling from the mobile station. The mobile station is capable of transmitting a message (e.g. a closed loop power command) indicating that the quality of the signalling received from the base station is too low or then that the quality is too high. At the base station the message can be received by

a transceiver unit 14 from which the message is passed to a power up/down controller 13 controlling the actual transmission power level of the transceiver unit 14. The transceiver unit 14 of the base station may increase the transmission power in order to improve the quality of the signal received at the mobile station end or lessen the transmission power in order to avoid any use of unnecessarily high transmission powers in accordance with instructions received from the unit 13.

The base station includes further a control unit 11. Control unit 11 is arranged to control the received power control commands or similar messages and to monitor the distribution of the power up and power down requests, as will be explained later. It is noted that even though this example shows the controller and the monitoring facility as a single unit 11, they could also be in the form of separated units. It is also to be appreciated that the single unit could also comprise the power up/power down control and/or any other possible control functionalities a transmitting station controller may have. It is noted that the MS may comprise similar functionalities and that monitoring can also be done at the mobile station of Figure 2, by means of appropriate monitoring and control apparatus 1 to 4 implemented in the MS.

The PC command from the MS and received at the BS may indicate that the transmission power level toward the MS (the receiving station in this example) should go up (power up) or that the transmission power level should go down (power down). In normal operation conditions the average distribution between the determined power up and power down situations should be about 50/50 within a certain predefined period, such a 100 frames or 100 seconds. If the form of the distribution within the period deviates from this, e.g. such that there are 80

requests for "up" and only 20 "down", this 80/20 distribution indicates that for some reason the connection does not meet the quality requirements and that the receiving station (for instance, the control unit, such as a CPU 1, of the mobile station of Figure 2) keeps on requesting more transmission power so as to improve the quality of the received signal. In an opposite occasion, i.e. when there are 80 requests for "down" and only 20 for "up", this form of distribution will indicate that the connection is far better than required, and the transmission power could thus be reduced more rapidly to the normal level, i.e. to a predefined transmission power default level.

The need for sending a power up or a power down request is determined on the basis of monitoring the quality of the received transmission signal at the receiving station (i.e. either at the BS or the MS). This determination can, for example, be based on monitoring whether the FER (Frame Error Ratio) meets the FER target or not. If not, the SIR (Signal to Interference Ratio) target is raised, and subsequently a power up request is formed and transmitted to the transmitting station in order to improve the quality of the received transmission by increasing the transmission power of the connection. However, if the transmitting station cannot respond to this request, the result is that the receiving station will still suffer from a bad quality connection, and in order to correct the situation it will increment the power requirement e.g. by 0.5dB. As already explained, this will only lead to an unwanted rise in the target value, and the correction of this "unnatural" situation may take some time.

As disclosed by the flow chart of Figure 3, in the proposed solution the quality target (such as the Eb/No target or SIR

target) is prevented from rising should a power limitation situation occur by returning a predefined transmission parameter of the connection, such as the power level or quality target to a predefined or default value in case monitoring of distribution of the defined power up and power down needs shows that the form of the distribution deviates a predefined amount from average. According to one alternative this can be accompanied by monitoring the transmitted closed loop PC commands by the monitoring unit 11 (or unit 2 of the mobile station) in order to detect the power up or power down requests from these commands. The monitoring may also occur already at the stage of determining a need for a change in the power level at the receiving station. In any case, the logic here is that if the transmission power is limited at the transmitting station or if the transmitting power is far too high, then the distribution for the transmitted up/down commands will become deviated significantly from an average 50/50 situation in either direction (up/down) at the receiving station, as it keeps on asking more (connection weakened) or less (connection improved) power over a certain predefined period or window.

One algorithm which can be used here is in pseudocode as follows.

```
SIR_old=SIR_target (n)

Calculate the average amount of transmitted "up" commands
during a period of k frames. Then
IF average > threshold1
        SIR_target (n+k)=SIR old;
ELSE IF average < threshold2
        SIR_target(n+k)=SIR_old;
END
```

The threshold values can be set in accordance with predefined control parameters to achieve satisfactory performance. According to one possibility, the control parameters used in the algorithms can be sent to each BS of the system over an Iub interface and/or over the air interface from the BS to the MS. The control parameters can also be centrally updated e.g. by the network operator, e.g. in the case that more/less transmission power resources become available, either temporarily or permanently. Instead of having the control unit within the receiving station, the control unit for this can also be situated in another network or there could be separate control units interfacing the network including the receiving and the transmitting stations.

As can be seen from the above algorithm, when the control unit of the receiving station determines that the form of the distribution deviates more than is allowed from the average distribution, it will immediately return the SIR_target to the predefined SIR_old value, whereafter the operation will continue from this default value, and thereby excessively high target values are avoided in case of limited transmission power and the power level is returned rapidly into a minimal appropriate level should the connection conditions suddenly improve. Even though the quality of the connection does not become better as such by means of this proposal, it does help in removing problems relating to an excessive increase of the target value.

According to one embodiment, if the above algorithm determines the SIR target increase at the BS, this action shall be reported to the radio network controller designated by 12 in Figure 2 which may then proceed accordingly, e.g. reserve more

power resources for that precise transmission or send an appropriate message to the network operator indicating that there are some problems in the power levels or other transmission parameters.

It should be noted, that this type of algorithm can also be used in a concatenated form, i.e. two or more different sets of control parameters can run in parallel. In practice this can be implemented e.g. such that there are two monitoring periods, a shorter one and a longer one, wherein the arrangement is such that in the shorter monitoring period the control parameters are set such that a greater deviation in the distribution is allowed, while the longer period averaging a greater amount of frames allows a smaller amount of deviation in the distribution. By means of using several sets of control parameters it is possible to improve further the system's sensitivity for different types of variations and/or disturbances in the connection.

At present the proposed solution as such is believed to be preferably applicable at the MS end, considering current implementation of network functionalities. However, the solution can be equally implemented at the BS side as well or instead without departing from the scope of the idea. In addition, even though the preferred implementation at the moment is such that the determining of the need for power up or power down requirements and the monitoring of the distribution thereof are both accomplished at the receiving station, this can also be implemented such that only said determining step of the need for power up or power down is accomplished at the receiving station and said monitoring of the distribution is then accomplished at the transmitting station subsequent to having received the power up/power down commands or similar

indication of the changed power requirements. In the latter alternative the transmitting station can then, for example, purely ignore the power up requests without any further processing after having detected a deviation in the distribution exceeding a threshold value, or immediately drop the transmitting power in case a power down biased distribution is recognised.

In addition to the deviation of the average, the monitored form of the distribution can also be, for instance, a certain pattern of the power up and power down requirements indicating some special air interface condition. After having detected a predefined form of subsequent power up and power down requirements, the system may change the predefined transmission parameter, such that the quality target or the power level in accordance with predefined parameter values, such as return the quality target or power level to a default (lower) value or to increase the target or power level by more than one "normal" step at once or then "freeze" the parameter to a certain value for some time. This type of distribution form detection can also form part of the concatenated solution whereby the transmission parameter adjustment will be based simultaneously both on the distribution deviation detection and on the distribution pattern detection.

If the adjustment system is biased e.g. such that it will automatically lower the power level or the quality target if no power up requests are received, the form of distribution used in the proposed solution can then be derived from the proportion between the received power up requests and the power down status.

Figures 4 to 6 show simulation results for the SIR target as

function of time obtained for the above algorithm when simulated with a COSSAP simulator by Synopsys Inc. for three different FER values, which were FER=0.013 (with unlimited PC dynamics), FER=0.0255 (with limited PC dynamics), and FER=0.0715 (with limited PC dynamics), respectively. (The unlimited case assumes that there will be no power limitations whatsoever, whereas in the limited case there is a transmission power limit). In the diagrams the horizontal axis defines the number of frames and the vertical axis defines the SIR target in dB.

In the simulation the PC commands were averaged on 20 frames periods (320 PC commands), and the threshold1 was set to equal 0.6. These parameters leave 0.2x320=64 PC command margin for the UP commands, i.e. the power can rise 64 dB during the average period without the algorithm giving a false alarm (in case the PC commands are otherwise error free). The channel was a 2-tap channel with antenna diversity (uncorrelated antennas) and the used channel speed was 3 km/h.

As can be seen from Figures 4 to 6, the algorithm is capable of efficiently cutting the increase in the SIR target value and rapidly returning the power level into a predefined initial value. This can be concluded from the fact that the SIR target will not become raised permanently even in Figure 6 instance where the FER value is substantially high.

Thus the invention provides a clear advantage over the prior art proposals, as it enables more rapid and dynamic response to the changed transmission conditions and makes it possible to avoid unwanted increases in the connection quality target values in cases where it is not possible to receive any more transmission power.

It is noted herein that while the above describes some embodiments of the present invention there are several variations and modifications which may be made to the disclosed solution without departing from the spirit and scope of the present invention as defined in the appended claims.

Claims

1. A method of controlling at least one transmission parameter of a connection between a transmitting station and receiving station in a communication system comprising:

receiving at the receiving station a transmission signal from the transmitting station;

determining from the received transmission signal whether there exists a power up requirement or a power down requirement;

monitoring the distribution of the power up and power down requirements over a period; and

in the event that a predefined form of the distribution is detected, changing quality target for the received signal.

2. A method in accordance with claim 1, comprising changing the power level of the transmission.

3. A method in accordance with any of the preceding claims, further comprising:

transmitting power control commands between the transmitting station and the receiving station, said power control commands including either the power up or the power down request in accordance with the determined requirement, wherein the step of monitoring the distribution of the power up and the power down requirements comprises monitoring the requests derived from the power control commands.

4. A method in accordance with claim 1 or 2, wherein the form of the distribution of the power up and the power down requirements is defined on basis of variations in a Signal Interference Ratio (SIR) target.

5. A method in accordance with any of the preceding claims, wherein the transmitting station is a base station of a mobile communication system and the receiving station is a mobile station.

6. A method in accordance with any of the preceding claims, wherein said determining of the power up requirement or power down requirement and said monitoring of the distribution are accomplished at the receiving station.

7. A method in accordance with any of claims 1 to 5, wherein said determining of the power up requirement or power down requirement is accomplished at the receiving station and said monitoring of the distribution is accomplished at the transmitting station.

8. A method in accordance with any of the preceding claims, wherein the step of changing the transmission parameter of the connection comprises returning the transmission parameter of the connection to a predefined value.

9. A method in accordance with any of the preceding claims, wherein at least some of control parameters used for controlling the transmission parameter of the connection are transmitted to the receiving and/or transmitting station using radio network apparatus.

10. A method in accordance with claim 9, wherein the control parameters are defined in and/or control parameter updates are transmitted from a separate control unit.

11. A method in accordance with any of the preceding claims, comprising simultaneous use of at least two different sets of

control parameters used for controlling the connection.

12. An arrangement for controlling at least one transmission parameter of a connection between a transmitting station and a receiving station in a communication system comprising:

a control unit for determining a power up requirement or a power down requirement from a signal transmitted from the transmitting station;

means for monitoring the distribution of the power up and power down requirements over a period; and

means for changing the quality target of the transmission in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

13. An arrangement in accordance with claim 12, comprising means for changing the power level of the transmission.

14. An arrangement in accordance with any of claim 12 or 13, wherein the means for changing the transmission parameter of the connection are arranged to return the transmission parameter to a predefined value.

15. An arrangement in accordance with any of claims 12 to 14, wherein the receiving station comprises the control unit, the means for monitoring distribution of the power up and the power down requirements and the means for changing the transmission parameter.

16. An arrangement in accordance with any of claims 12 to 15, wherein the transmitting station is a base station and the receiving station is a mobile station.

17. A receiving station for use in a communication system,

comprising:

means for receiving a signal from a transmitting station;

a control unit for determining a power up requirement or a power down requirement;

means from monitoring the distribution of the power up and power down requirements over a period; and

means for generating and transmitting a request for transmission parameter change to the transmitting station in the event that the means for monitoring detect a predefined form of distribution in the monitored distribution.

18. A receiving station in accordance with claim 17, wherein the transmission parameter comprises quality target of the received transmission.

19. A receiving station in accordance with claim 17, wherein the transmission parameter comprises power level of the transmission.

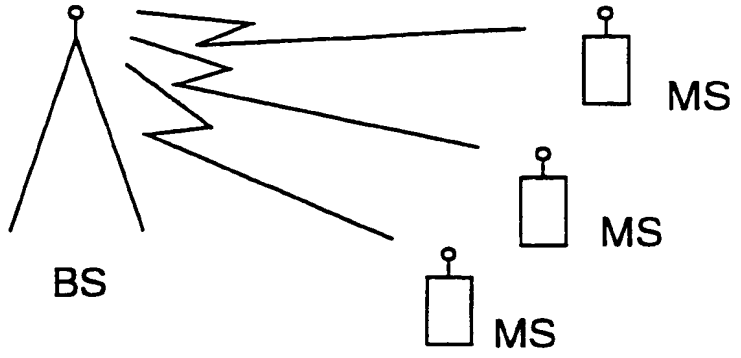

MS
MS
MS
BS

FIG. 1

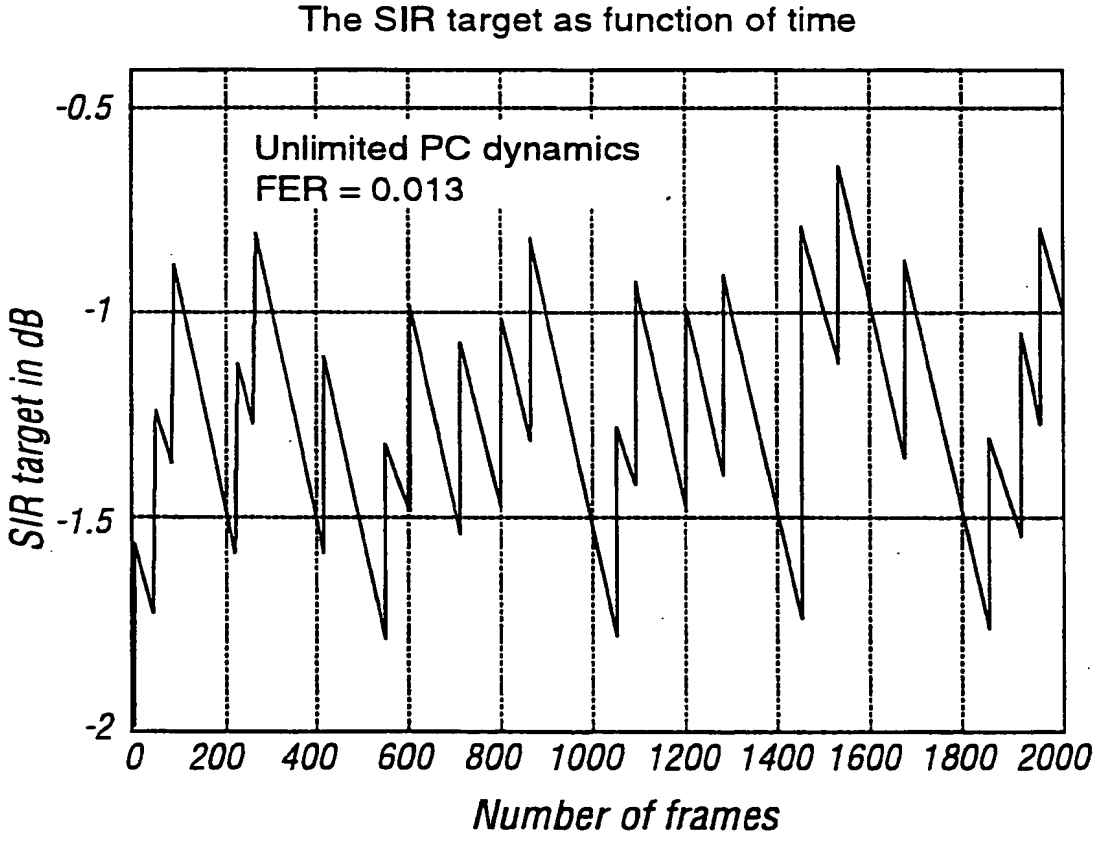

The SIR target as function of time
Unlimited PC dynamics
FER = 0.013
SIR target in dB
-0.5
-1
-1.5
-2
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Number of frames

FIG. 4

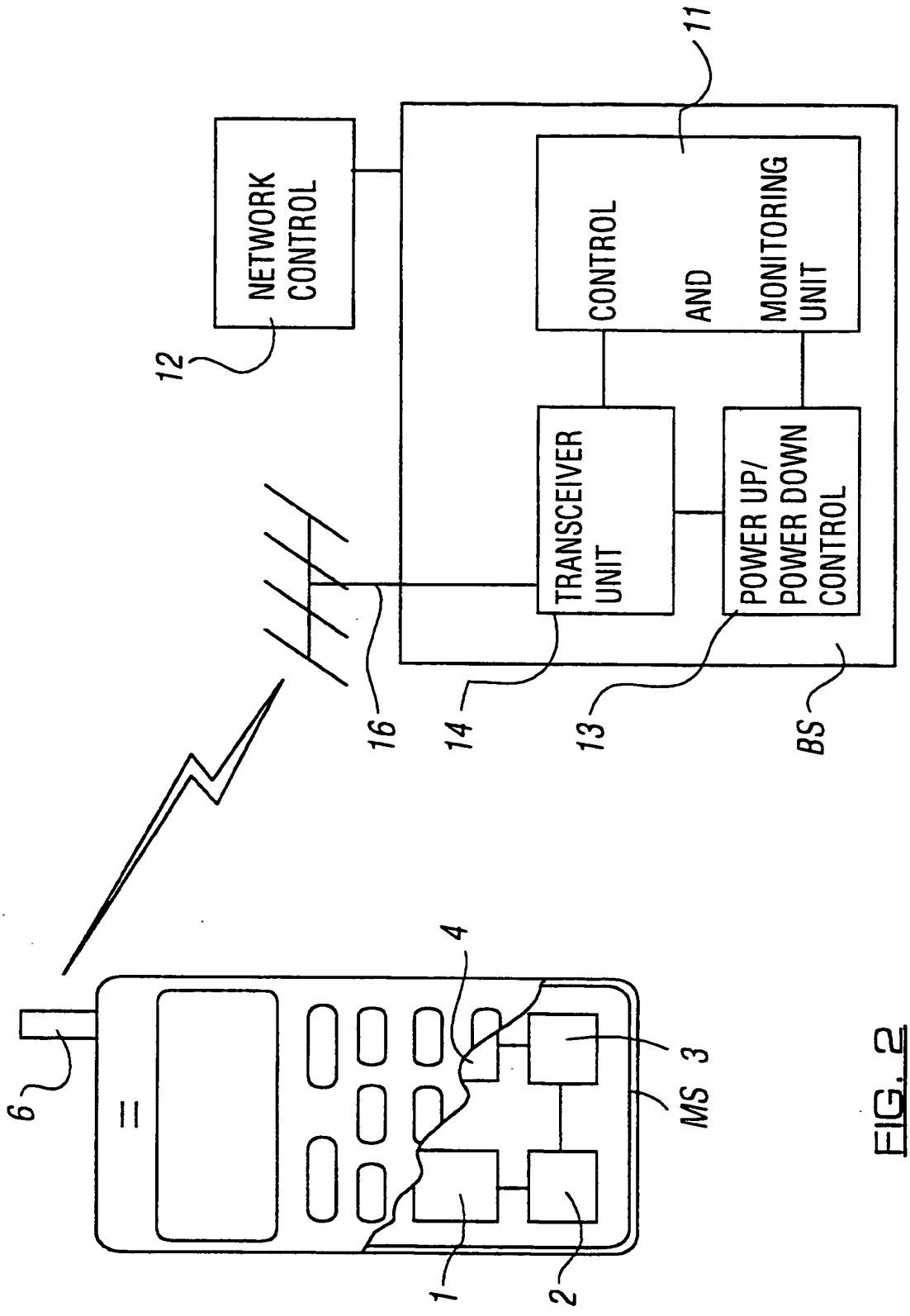

NETWORK CONTROL
12
11
CONTROL AND MONITORING UNIT
TRANSCEIVER UNIT
POWER UP/ POWER DOWN CONTROL
16
14
13
BS
4
3
MS
6
1
2

FIG. 2

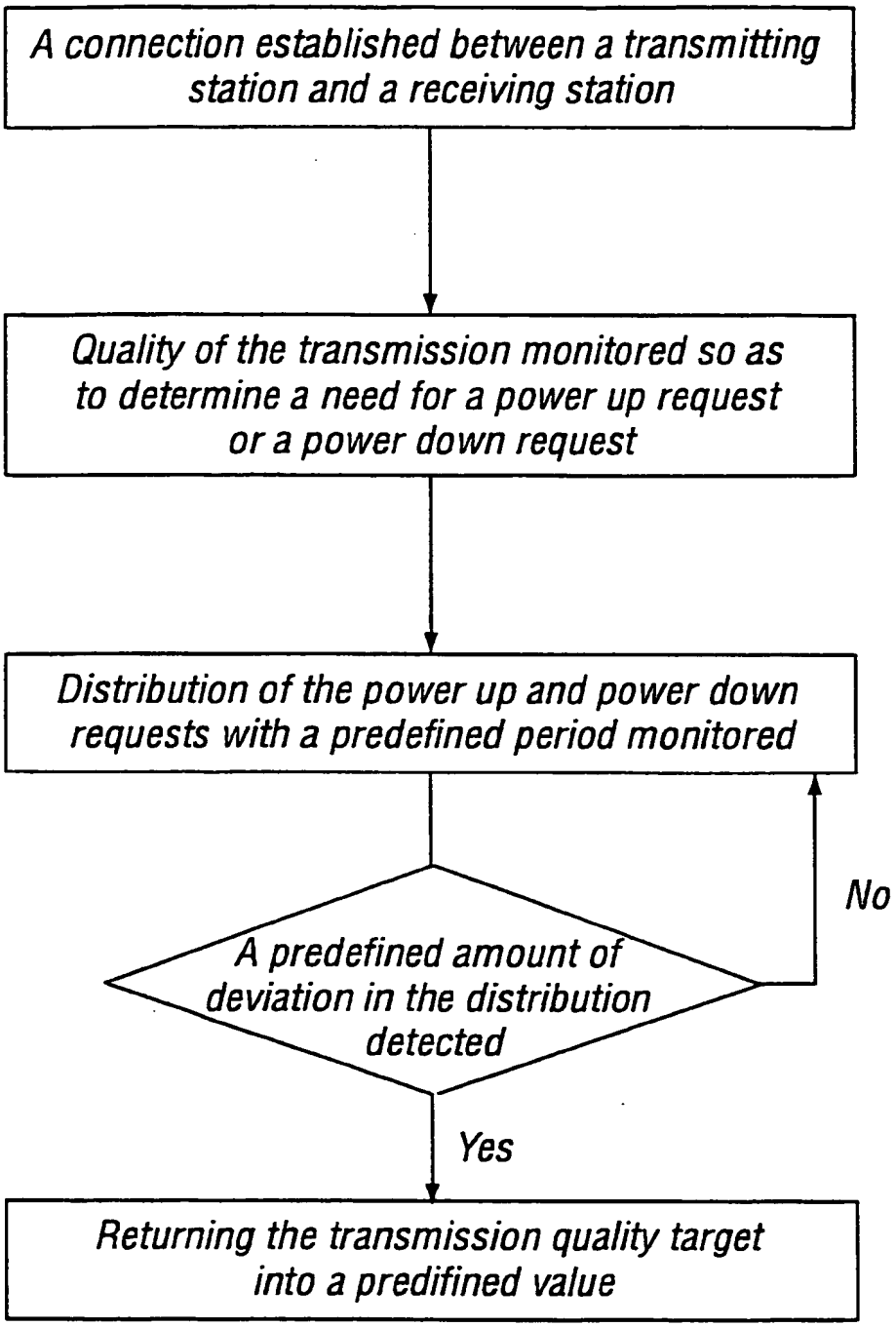

A connection established between a transmitting station and a receiving station
Quality of the transmission monitored so as to determine a need for a power up request or a power down request
Distribution of the power up and power down requests with a predefined period monitored
A predefined amount of deviation in the distribution detected
No
Yes
Returning the transmission quality target into a predifined value

FIG. 3

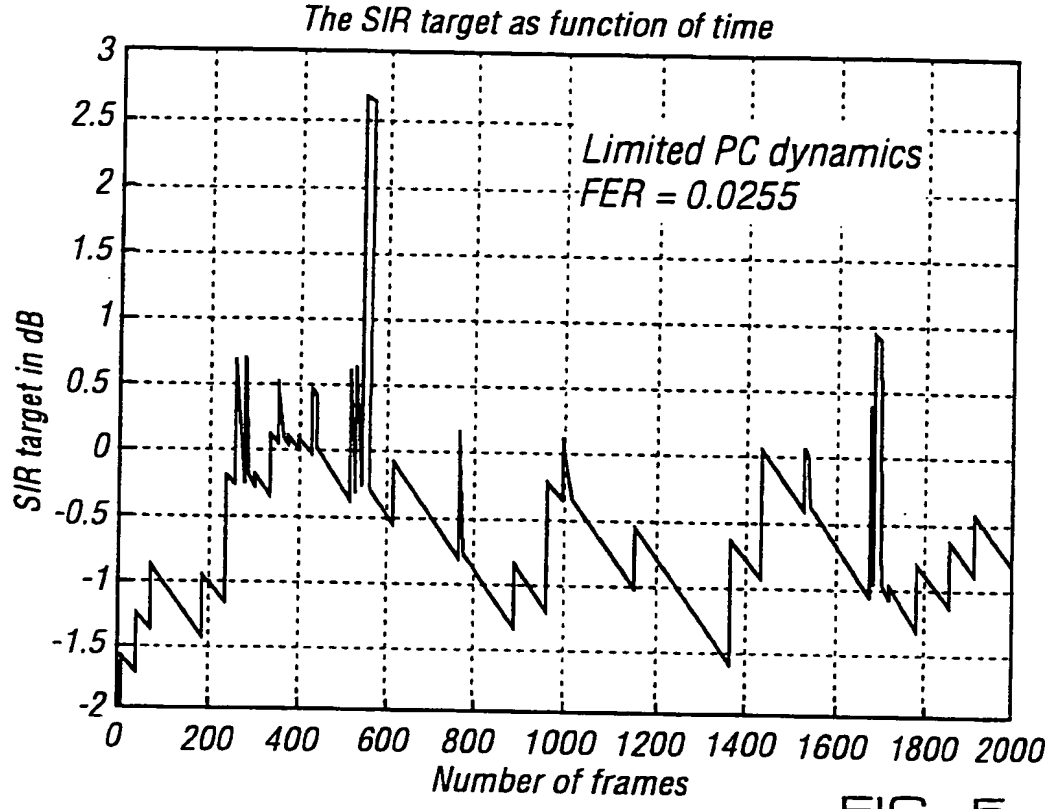

The SIR target as function of time
Limited PC dynamics
FER = 0.0255
SIR target in dB
Number of frames
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
200
400
600
800
1000
1200
1400
1600
1800
2000

FIG. 5

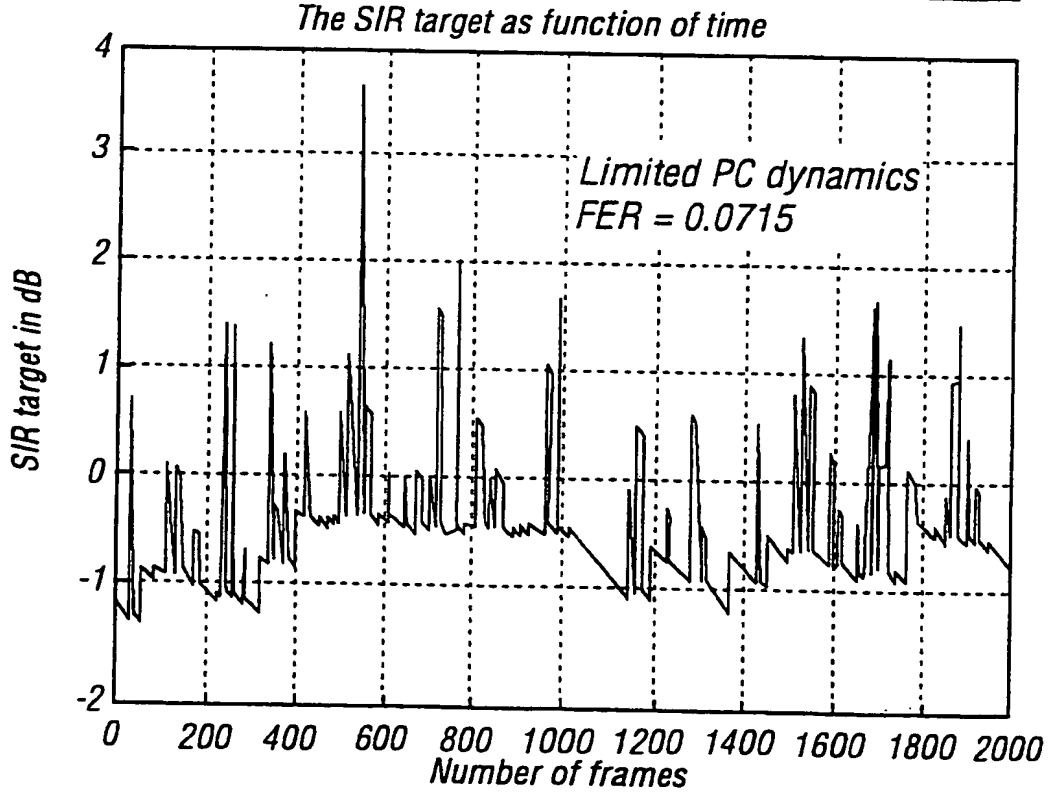

The SIR target as function of time
Limited PC dynamics
FER = 0.0715
SIR target in dB
Number of frames
4
3
2
1
0
-1
-2
0
200
400
600
800
1000
1200
1400
1600
1800
2000

FIG. 6

INTERNATIONAL SEARCH REPORT

Interna ..al Application No
PCT/EP 00/08145

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B7/005

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 924 043 A (TAKANO MICHIAKI) 13 July 1999 (1999-07-13) column 18, line 9 -column 19, line 41; figures 10,25-29	1-5, 7-17,19
A	EP 0 709 973 A (NIPPON TELEGRAPH & TELEPHONE) 1 May 1996 (1996-05-01) abstract; figures 10,13 column 3, line 5 - line 32 column 7, line 16 - line 56; figures 5,6 column 8, line 57 -column 9, last line; figures 7,8	1,3-7, 12,15-18
A	EP 0 822 672 A (NIPPON TELEGRAPH & TELEPHONE) 4 February 1998 (1998-02-04) abstract; figures 6,8,10,25,26	1-3,5, 9-13, 15-17,19

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 November 2000	04/12/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Sieben, S

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INTERNATIONAL SEARCH REPORT

Interna .al Application No
PCT/EP 00/08145

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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E	WO 00 52846 A (HAARDT MARTIN ;SCHULZ EGON (DE); SIEMENS AG (DE); DILLINGER MARKUS) 8 September 2000 (2000-09-08) abstract; figure 2 page 4, line 20 - last line claims 1,12,14,15	1,4-6, 11,12, 15,16

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

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